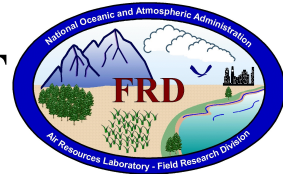


# FRD ACTIVITIES REPORT

## November 2006



### Research Programs

#### *UrbaNet/ARL*

Representatives from each of the ARL divisions met in Silver Spring on 16-17 November to discuss the future direction of ARL's transport and diffusion research. Roland Draxler from Headquarters put together a draft plan for a NOAA Plume Prediction Program, and this became the focus of the meeting. The program envisions an integrated plume dispersion modeling system that covers a wide range of spatial scales. Research related to the program would involve both ARL and ESRL in Boulder as well as NOAA's National Ocean Service (the originators of ALOHA and CAMEO first responder dispersion models), and the eventual transition to operations would of course involve NCEP and the NWS. FRD will contribute to the Plume Prediction Program in several ways, assuming the program proceeds. First, the dispersion modeling that FRD conducts as part of its DOE partnership would be coordinated with the NOAA program. Second, FRD's expertise in tracer research would likely be used in evaluating the dispersion modeling system. Third, the urban dispersion activities at FRD, including UrbaNet, would be folded into the Plume Prediction Program. (Kirk Clawson and Richard Eckman, 208-526-2740)

#### *UrbaNet/Urban Dispersion Program*

The URBAN 2000 experiments were conducted in the complex urban and topographical terrain of Salt Lake City in stable nighttime conditions. This setting resulted in the realization of some plume dispersion complications that can arise due to the interaction of complex terrain and mountain-valley flow dynamics, drainage flows, synoptic effects, and urban canopy affects, all within a nocturnal boundary layer. It was found that plume dispersion can be significantly different than what might be expected based upon the available wind data and that it is problematic to rely on any one urban area wind measurement to predict or anticipate dispersion. Some of the anomalies observed include extremely slow dispersion, complicated recirculation patterns, flow decoupling and plume dispersion apparently independent of the measured local winds, and possible upwind diffusion. An initial draft manuscript, "Analysis of Plume Dispersion in a Nocturnal Urban Boundary Layer in Complex Terrain, Salt Lake City, URBAN 2000", is in the final stages of preparation. (Dennis Finn, 208-526-0566)

#### *Smart Balloon*

Word was received this month that the Congressional earmark that has been funding the smart balloon was not included by Senator Gregg of New Hampshire in the budget for FY07. As a result, smart balloon development has been discontinued. Any remaining funds that can be found will be used to analyze and publish the NEAQS and TEXAQS data. Before word of funding

cuts were received, improvements were made to the smart balloon flight control system. A larger valve was designed that functions as both the helium pressure relief valve and balloon cut-down valve. A prototype was manufactured and is shown in Fig. 1.

Actuation time (time from fully open to closed) is dependent on the battery voltage. With a battery voltage of 12.0 volts the actuation time is around 1.1 seconds compared to about 3 seconds for the smaller valve that has been used on

the smart balloon transponder. The valve is obviously able to actuate faster because it uses about 5 times more energy than the smaller valve for each actuation. Testing indicates that the valve seals completely when closed. Further testing is necessary to determine if the valve releases helium fast enough to serve as the balloon cut-down device. (Randy Johnson, 208-526-2129)

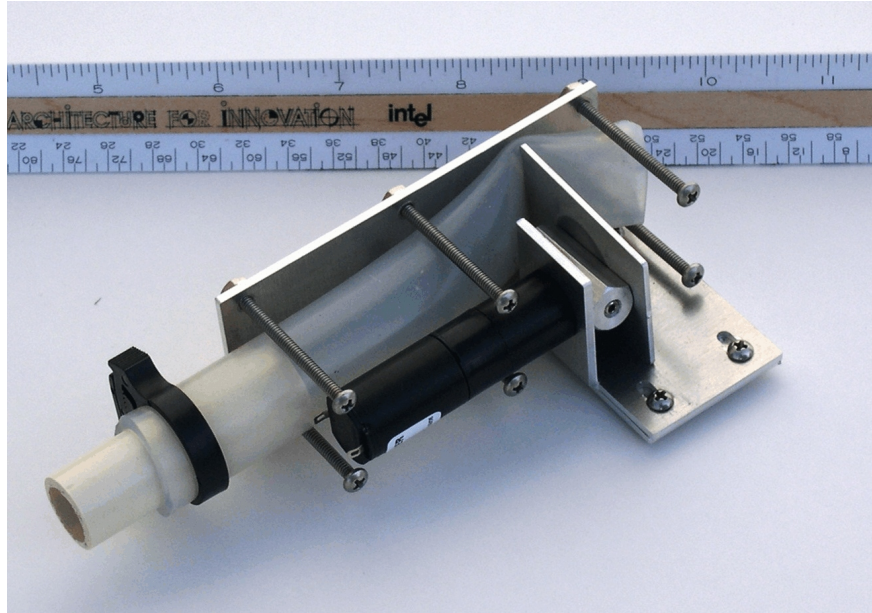


Figure 1. Prototype of the new and improved helium pressure relief valve and balloon cut-down valve on the smart balloon.

### ***Perfluorocarbon Tracer Analysis Development***

The perfluorocarbon tracer (PFT) analysis development focused on further evaluating the analysis system concentration dynamic range of the species PDCB, PMCH, and m-PDCH. Additional testing has confirmed that the three species yield responses at concentrations of up to 1 ppm although the response becomes decidedly nonlinear. A more realistic, practical upper limit is probably in the range of a few hundred thousand pptv. The lower detection limit is something less than 10 pptv but has not been precisely determined due to the lack of an appropriate in-house low-level concentration standard. Further tests using ambient air samples from New York City will determine if there are possible interferences that might adversely affect application of the method. (Dennis Finn, 208-526-0566)

### **Cooperative Research with DOE NE-ID (Idaho National Laboratory)**

#### ***Emergency Operations Center (EOC)***

Team C attended their INL Emergency Response Operations requalification classroom training on 2 November. Every NOAA team member has now been requalified to serve in the Emergency Operations Center for the upcoming year.

FRD Team D participated in a drill at the EOC on 9 November. It involved a potential nitric acid release at MFC. The impacts of the simulated plume were very local, so a straight-line plume model using the wind observations from the nearest NOAA/INL Mesonet tower was suitable for estimating the hazard. (Richard Eckman, 208-526-2740, and Randy Johnson)

### ***Mesoscale Modeling***

FRD is continuing to evaluate the WRF model as an eventual replacement for the MM5 model that is currently used to provide high resolution simulations of the meteorology in the Snake River Plain. So far, the WRF evaluations have all been based on the NCAR version of WRF (called ARW), because it supports two-way nested grids. During a recent meeting at ARL Headquarters, someone stated that the NCEP version of WRF (called NMM) now supports nested grids, and it moreover tends to be faster than WRF-ARW. However, further investigation revealed that there is still no official support for nested grids in WRF-NMM, even though NCEP has conducted some internal tests of nesting. Without nesting, FRD will have a difficult time adopting WRF-NMM for local use in Southeast Idaho even if it is faster than WRF-ARW. (Richard Eckman, 208-526-2740)

### ***Transport and Dispersion Modeling***

On 30 November, FRD staff met with some of the INL contractors who are responsible for environmental assessments at INL. They are switching to the AERMOD plume model for the assessments, and this model has different input requirements compared to the previous model. In particular, AERMOD requires a vertical meteorological profile, which by default is obtained from nearby NWS rawinsonde observations. However, INL is quite distant from any rawinsonde station (e.g., Boise), so it is not clear that the rawinsonde observations are representative. One alternative is to use the data from FRD's 915 MHz radar profiler. This system can provide wind profiles up to roughly 2 km AGL, and the attached Radio Acoustic Sounding System (RASS) can provide temperatures up to about 1 km AGL. (Richard Eckman, 208-526-2740, and Neil Hukari)

### ***Sodar***

A mini-sodar, manufactured by Atmospheric Systems Corporation, was installed at the radar wind profiler site near Grid III by Dr. Ken Underwood on 31 October and 01 November. The sodar is designed to obtain near-surface winds in 5 m increments up to a height of 200 m AGL. This instrument will help to determine the height and behavior of the shallow boundary layer that develops every night at the INL. The system is currently in the testing and acceptance phase. It is planned to make the sodar data public at the completion of the testing and acceptance phase, which should be sometime in late spring or early summer of 2007. (Kirk Clawson, 208-526-2742, and staff)

### ***DOE-ID Senior Leadership Team Presentation***

On November 1, the DOE-ID Senior Leadership Team (SLT) comprised of the manager, deputy managers and other high ranking officials met to consider FRD's request for full funding of 5-6

FTE's and to consider FRD's request to be more involved in atmospheric research at the INL. The requested funding level would permit FRD to meet all of its obligations to the NOAA/INL Meteorological Research Partnership that is defined in a proposed Memorandum of Agreement and in a new Interagency Agreement for FY07. FRD began to be fully funded for 5-6 FTE's in 1994, but flat funding since that time with no annual COLA's has effectively reduced the funding level to approximately 3 FTE's. Unfortunately this funding level only maintains the NOAA/INL Mesonet and the data Quality Assurance program and does not allow for any additional effort. Kirk Clawson gave a presentation of NOAA's role at the INL to the SLT and, together with the DOE COR, Betsy Holmes, presented the case for COLA funding and greater integration of NOAA into INL atmospheric research programs. The presentations were well received and the COLA funding is now dependent on Congress passing a budget for FY 2007. Additionally, we have had subsequent discussions with INL personnel on better integrating NOAA into INL atmospheric research projects. (Kirk Clawson, 208-526-2742)

## **Other Activities**

### ***Papers***

Businger, S., **R. Johnson**, and R. Talbot, 2006: Scientific Insights from Four Generations of Lagrangian Balloons in Atmospheric Research. *Bulletin of the American Meteorology Society*. Volume 87, No. 11, pp. 1539-1554.

**Eckman, R. M.**, R. J. Dobosy, D. L. Auble, **T. W. Strong, T. L. Crawford**: A pressure-sphere anemometer for measuring turbulence and fluxes in hurricanes. *Journal of Atmospheric and Oceanic Technology*. (In press)

Doran, J.C., K.J. Allwine, J.E. Flaherty, **K.L. Clawson**, and **R.G. Carter**: Characteristics of Puff Dispersion in an Urban Environment. *Atmos Environ*. (Accepted)

**Clawson, K.L., R.G. Carter, D.J. Lacroix, J.D. Rich, N.F. Hukari, R.C. Johnson, and T. Strong**: Midtown Manhattan 2005 (MID05), SF<sub>6</sub> Atmospheric Tracer Field Tests. NOAA Technical Memorandum OAR ARL, Air Resources Laboratory, Idaho Falls, Idaho. (ARL review)

### ***Safety***

Booklets on winter safety were given to all employees. Important facts about injuries related to cold, snow, and ice were shared along with preventative measures to reduce injuries.

### ***Travel***

Kirk Clawson, 15-18 November 2006, Silver Springs, MD, to attend an ARL Dispersion Program planning meeting.

Rick Eckman, 15-17 November 2006, Silver Springs, MD, to attend an ARL Dispersion Program planning meeting.

### ***Training***

Jason Rich, 15-16 November 2006, Salt Lake City, UT, to attend the 13<sup>th</sup> Intermountain Weather Prediction Workshop.

### ***EEO***

The FRD federal staff participated in a NOAA-provided EEO training video teleconference from ASMD in Research Triangle Park, NC, on 08 November. Federal staff from SORD participated jointly in the 2-hour training session. Presentations were made by Jack Dunlap, an attorney with International Training Associates (a NOAA contractor), and Tony Tafoya (NOAA Research EEO Manager).

### ***Personnel***

Donna R. Mills, Administrative Assistant, joined the FRD staff on November 13, 2006. She transferred from the National Weather Service in Pocatello, ID after working there for 11 years.

### ***Visitors***

Dr. Sam Ryu and Mr. Seung Choi of the Agency for Defense Development of the Republic of South Korea visited FRD on 22 November. Each group discussed its dispersion modeling and testing efforts. The Koreans have begun their own dispersion modeling program because they cannot reliably obtain software updates of major models currently in use. Seoul is within artillery of North Korea and CBN atmospheric releases within the city are a possibility. At the close of the visit, the Koreans invited us to Korea for a consultation visit at a date to be determined in the future.